Evaluation of Covid-19 Impact on Maternal and Neonatal Health Services Continuity at the Cite-Verte Health District in Yaounde, Cameroon

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Abstract

Purpose: The goal of this study was to evaluate the impact of the 2020 Covid-19 outbreak in Cameroon on the continuity of Maternal and Neonatal Health Services (MNHS) at the Cite-Verte Health District.

Problem: The advent of this pandemic has threatened the progress made so far in reducing maternal and neonatal mortality meanwhile the continued provision of MNHS is a predominant solution to support and improve the health of women and girls [1,2].

Methods: A mixed study was carried out with 11 MNHS users and 4 health facilities in the Cite-verte health district. The indicators of MNHS continuity were listed using a questionnaire, a Dhis2 data collection form and a semi-structured interview guide. Data were subject to SPSS analysis based on the comparison of MNHS continuity and manual content analysis.

Results: Context-Based Theory guided the discussion of our results which showed an indirect impact of the pandemic on MNHS continuity, characterized by a drop in number of MNHS health personnel with a high turnover rate of 79% and a staff attack rate estimated at 8%. We also found MNHS disruptions due to stock shortage in 100% of health facilities surveyed, a statistically significant decrease of 9% (Diff = 0.09; P-value = 0.000; 95%; CI = [0.075; 0.104]) and 17% (Diff = 0.17; P-value = 0.000; 95%; CI = [0.076; 0.264]), respectively for the indicators of family planning and neonatal deaths, a decrease of 22% on first ANC attendance, a drop of 28% on skilled birth attendance, and finally, an increase of 65% on maternal...
Introduction

Maternal and newborn health services (MNHS) are of critical importance to public health care delivery systems, particularly in low- and middle-income countries (LMICs). In Cameroon, thousands of women die each year from complications related to pregnancy or childbirth, while a significant number of newborns suffer from preventable illnesses [3]. The level of maternal mortality has remained high for several decades in Cameroon [4]. Cameroon is therefore one of the countries where maternal and newborn health indicators remain worrying despite the commitments made and the actions carried out [5]. Well-designed, appropriate and timely antenatal care (ANC), delivery and postpartum care services, as well as newborn care and mandatory immunizations form a circle of improving maternal health and neonatal. Disruption at any stage can lead to negative results.

The recent coronavirus (COVID-19) pandemic has challenged the resilience of the world’s most effective health systems. It has disrupted the continuum of care and forced health systems to prioritize the services they provide [6]. Due to the pandemic, health personnel, equipment and facilities have been transposed to cope with the increasing number of COVID-19 patients. Although COVID-19 death rates appeared low among children and women of childbearing age [7], these groups may have been disproportionately affected due to the disruption of routine health services, particularly in LMICs like Cameroon.

While Cameroon has moved from the shock of large-scale restrictive measures to a gradual return to normal, the fact remains that the new normal will be very different from the past, as we fight against a pathogen agent that could well stay with us for a while or even never disappear. With this in mind, this study aimed at evaluating the impact of the 2020 Covid-19 outbreak on the continuity of maternal and neonatal health services at the Cite-verte health district. To address this issue, we first determined and compared the capacity of maternal and neonatal health services in the Cite-verte health district between 2019 and 2020. Secondly, we described and confronted the level of health service utilization of maternal and neonatal health services in the Cite-verte health district from 2019 to 2020. And finally, we analyzed the perceptions of MNHS users in the Cite-verte health district during the 2020 Covid-19 outbreak in Cameroon. This was an analytical study that allowed informed decisions to be made by estimating the indirect effects of the Covid-19 pandemic on MNHS in addition to the existing database of knowledge.

Materials and Methods

Research Type

We conducted a retrospective cross-sectional mixed study for comparative analytical purposes.

Site of the Study

The study was carried out in the Cite-verte health district of the city of Yaounde in Cameroon.

Participant Characteristics

Our study population consisted of:

Quantitative aspect: all health personnel in charge of Maternal and Neonatal Health in health facilities of the Cite-Verte Health District having both a maternity service and a functional neonatal unit during the 2020 Covid-19 outbreak.

Qualitative aspect: all users of maternal and neonatal health services in health facilities of the Cite-Verte Health District having both a maternity service and a functional neonatal unit during the 2020 Covid-19 outbreak.

Selection Criteria

All concerned participants were the health personnel and the users of MNHS in health facilities of the Cite-Verte Health District having both a maternity service and a functional neonatal unit during the 2020 Covid-19 outbreak who expressed their interest in the study.

Sampling Procedure

In the present study, the sampling method was exhaustive probabilistic for the quantitative aspect, while for the qualitative aspect, it was non-probabilistic of convenience.

Sample size at the quantitative level: thanks to the knowledge base made available to us, we selected 4 of the 67 health facilities and all the four selected health facilities (Yaounde Central Hospital, Bethesda Hospital, CME Future Deo Gracias and Notre Dame de la Merci Dispensary) having both a maternity service and a functional neonatal unit during the 2020 COVID-19 outbreak.

At the qualitative level: once these health facilities were chosen, due to saturation, 11 MNHS users were then interviewed by a non-probability convenience sampling method for the qualitative approach.

Data Collection Technique

In this study, we used triangulation as the data collection technique. It consisted of a documentary review, interviews and non-participatory observation. Interviews were conducted both in French and in
English according to the native language of each respondent.

**Data Collection Tools**

Data collection tools for our study were:

**Questionnaire:** a questionnaire to determine the capacity of maternal and neonatal health services in the 04 target Health facilities of the Cité-Verte Health District between 2019 and 2020 was developed following the WHO guidance tool for evaluating the continuity of Services during the Covid-19 outbreak.

**Collection grid:** a collection grid was developed to guide the extraction of data on MNHS continuity indicators between 2019 and 2020 in the Cité-Verte Health District, within the target health facilities with the aim of describing the level of use of Maternal and Neonatal Health Services in the Cite-verte Health District from 2019 to 2020.

**Interview guide:** an interview guide was developed to analyze the perceptions of users of Maternal and Neonatal Health Services in the Cite-verte Health District during the 2020 Covid-19 outbreak in Cameroon. It was administered during individual interviews directly to MNHS users.

**Data Analysis**

**Quantitative aspect:** it was based on the proportion tests, thus making it possible to measure the significant difference of continuity indicators used in this study. The bivariate analysis based on the comparison of proportions levels made it possible to report the capacity of MNHS and describe the level of use of MNHS in health facilities of the Cite-verte Health District between 2019 and 2020.

**Qualitative aspect:** it consisted of content analysis done in 6 steps inspired by the thematic analysis model of Braun & Clarke (2006) [8]. These steps are the full transcription, the coding, the grouping, the proofreading, the thematic grouping and the presentation.

**Results**

**Capacity of Maternal and Neonatal Health Services in the Cite-Verte Health District between 2019 and 2020**

**Core health Personnel**

Attack rate is the number of test-confirmed Covid-19 cases in a workplace outbreak setting per 100 staff employed in that setting. An attack rate measures the proportion of persons in an identified population who become infected during an outbreak [9].

Turnover with “turn” for rotation and “over” for replacement means the rotation of employees in a company. Also called staff turnover rate, it expresses the renewal of the workforce within a company. Turnover takes into account the departures and arrivals of employees over a targeted year. The formula used to calculate the turnover rate is \[(\text{Number of departures in the current year + the number of arrivals})/2\] / Workforce as of January 1 of the current year. The result must be multiplied by 100 to get a percentage [10].

Comparing Covid-19 attack rates between areas shows that Bethesda Hospital has the highest rate, estimated at nearly 18%. The latter corresponds to a zero turnover rate. This suggests that the attack rate is linked to the turnover rate, since the areas with a relatively high attack rate are those which have a relatively low turnover rate.

Finally, during the Covid-19 pandemic, more health personnel left MNHS and fewer health personnel were assigned to them. Staff renewal in MNHS or the turnover rate has therefore seen a decrease, expecting...
a negative rate of change of -79% which shows that staff turnover in MNHS decreased by 79% during the 2020 Covid-19 outbreak in Cameroon.

Health infrastructures and supplies
In the Cite-verte Health District, the capacity to provide care was disrupted by stock shortage issues during the Covid-19 pandemic in 2020.

Figure 2: MNHS Suffered of Stock Shortage during Covid-19

Level of use of Maternal and Neonatal Health Services in health facilities of the Cite-verte Health District between 2019 and 2020

MNHS continuity indicators

- Use of a modern contraceptive method in the Cite-verte Health district between 2019 and 2020

The number of women and girls using a modern contraceptive method decreased by 4,772, from 8,122 in 2019 to 3,350 in 2020, a change of 59%. It is important to note that data was not broken down by health areas, with the exception of Bethesda Hospital, where the fluctuation was 69%.

Figure 3: Comparison of Old Modern Contraceptive Method Users in the Cite-Verte Health District between 2019 and 2020. Source: [10]

Figure 4: Comparison of New Modern Contraceptive Method Users in the Cite-Verte Health District between 2019 and 2020. Source: [11]
The number of new modern contraceptive methods users decreased from 3,938 in 2019 to 2,256 in 2020, thus making a drop of 1,682 and a relative fluctuation of 43%. Likewise, a reduction of nearly 45% in the number of new users was recorded at Bethesda Hospital.

### Table 1: Significant Difference in the Use of Modern Contraceptive Methods between 2019 and 2020

<table>
<thead>
<tr>
<th>Health Facility</th>
<th>MNHS Continuity</th>
<th>2020</th>
<th>2019</th>
<th>Diff</th>
<th>CI (95%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispensaire Catholique Notre Dame de la Merci</td>
<td>0.0</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Yaounde Central Hospital</td>
<td>0.0</td>
<td>358.0 (0.04)</td>
<td>-0.04</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Bethesda Hospital</td>
<td>447 (0.13)</td>
<td>1445 (0.17)</td>
<td>-0.04</td>
<td>-0.087 - 0.013</td>
<td>0.014**</td>
<td></td>
</tr>
<tr>
<td>CME Afrique Future Deo Gracias</td>
<td>2 (0.0005)</td>
<td>0.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cite-verte Health District</td>
<td>3350.0</td>
<td>8122.0</td>
<td>-0.09</td>
<td>-0.104 - 0.075</td>
<td>0.000***</td>
<td></td>
</tr>
</tbody>
</table>

The proportion tests made it possible to attest to a significant difference in certain continuity indicators between 2019 and 2020. In particular, as shown in the table above, the level of use of modern contraceptive methods presented a statistically significant drop. The observed drop in the family planning indicator (Number of users having chosen a modern contraceptive method) was statistically significant at 95% confidence and showed a significant difference of 9% in the level of use (Diff = 0.09; P-value = 0.000; 95%; CI= [0.075; 0.104]) at the Cite-verte health district from 2019 to 2020.

• ANC attendance between 2019 and 2020 in the Cite-verte health district.

![Figure 5: Pregnant Women Aged 10-14 years Registered for ANC 1 between 2019 and 2020 in the Cite-Verte Health District. Source: [11]](image)

Generally speaking, in all the health areas of the Cite-verte Health District, the number of women aged over 19 years who registered for ANC 1 increased between 2019 and 2020, except at the "CME Afrique Future Deo Gracias" hospital. But at a 5% threshold, the observed fluctuations were not statistically significant (see figure above).

• Skilled birth attendance between 2019 and 2020 in the Cite-verte health district.
Figure 6: Pregnant Women aged 15-19 Years Registered for ANC 1 between 2019 and 2020 in the Cite-Verte Health District. Source: [11]

Figure 7: Pregnant Women Aged >19 Years Registered for ANC 1 between 2019 and 2020 in the Cite-Verte Health District. Source: [11]

Figure 8: Skilled Birth Attendance between 2019 and 2020 in the Cite-Verte Health District. Source: [11]
In the Cite-verte Health District between 2019 and 2020, we generally note a 28% reduction in the number of deliveries carried out in health facilities. As shown in the above figure, this drop is more pronounced at the central hospital which showed a significant drop of 58%. Furthermore, the number of deliveries carried out in health facilities had rather increased at the "CME Deo-Gracias" hospital.

**MNHS continuity impact result indicators**
- Maternal mortality between 2019 and 2020 in the Cite-verte health district
  The above figures collected from the Central Hospital of Yaounde and the Cite-Verte health district showed that the number of maternal deaths increased significantly from 2019 to 2020. The increase is estimated at almost 65% in the Cite-Verte health district where the number of maternal deaths almost doubled from 17 in 2019 to 28 deaths in 2020.
- Neonatal mortality between 2019 and 2020 in the Cite-verte health district
  The number of neonatal deaths fell by almost 12% in the Cite-verte health district. Neonatal deaths fell from 186 in 2019 to 164 in 2020. The most notable drop was observed at the Yaounde Central Hospital where neonatal deaths fell from 103 in 2019 to 47 in 2020, thus making a drop of 54%. On the other hand, at the "CME Afrique Future Déco Gracias" hospital, neonatal deaths increased by 70%. In fact, neonatal deaths increased from 10 in 2019 to 17 in 2020.

**Figure 9: Maternal Mortality Fluctuation between 2019 and 2020 in the Cite-Verte Health District. Source:** [11]

**Figure 10: Neonatal Mortality Fluctuation between 2019 and 2020 in the Cite-Verte Health District. Source:** [11]

**Table 2: Significant Difference in Neonatal Mortality between 2019 and 2020**

<table>
<thead>
<tr>
<th>Health Facility</th>
<th>MNHS Continuity</th>
<th>Diff</th>
<th>CI (95%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020 (N (P))</td>
<td>2019 (N (P))</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Indicator: neonatal mortality</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispensaire Catholique Notre Dame de la Merci</td>
<td>4(0.02)</td>
<td>0.0</td>
<td>0.02</td>
<td>-</td>
</tr>
<tr>
<td>Yaounde Central Hospital</td>
<td>47 (0.03)</td>
<td>103 (0.55)</td>
<td>-0.27</td>
<td>0.003***</td>
</tr>
<tr>
<td>Bethesda Hospital</td>
<td>35 (0.21)</td>
<td>36 (0.19)</td>
<td>0.2</td>
<td>0.83ns</td>
</tr>
<tr>
<td>CME Afrique Future Deo Gracias</td>
<td>17 (0.10)</td>
<td>10 (0.05)</td>
<td>0.05</td>
<td>0.65ns</td>
</tr>
<tr>
<td>Cite-verte Health District</td>
<td>164.0</td>
<td>186.0</td>
<td>-0.17</td>
<td>0.000***</td>
</tr>
</tbody>
</table>
According to the proportion test presented in the table above, the drop in neonatal deaths is statistically significant at 17% (Diff = 0.17; P-value = 0.000; 95%; CI = [0.076; 0.264]) in the Cite-verte health district which allowed us to attest to the statistically significant difference between the number of neonatal deaths recorded during the year 2019 and in 2020 during the Covid-19 outbreak in Cameroon.

**Perceptions of MNHS users in the Cite-verte health district during the 2020 Covid-19 outbreak in Cameroon**

**User opinions on healthcare offered in MNHS of the Cite-verte health district during 2020 Covid-19 outbreak in Cameroon**

According to interviews we had with patients, it emerged that they did not have any particular needs to submit to health personnel. Their needs were normal as usual including: care for pregnant women, care for those who have given birth and care for newborns. With or without the presence of Covid-19, these women expressed the same needs. Despite the rigor of the barrier measures, they claim to have obtained satisfaction of their needs, to have continuously followed the prenatal visits. This is evidenced by the following comments:

“My first need was for monitoring my pregnancy, and also a need for family planning which was met. The prenatal follow-up brought me satisfaction.” (Respondent 8)

“Yes, I kept all my prenatal consultation appointments. Concerning me in particular, I did not respect my post-natal consultation appointments, just as I gave birth without problems” (Respondent 3)

The advent of Covid-19 has certainly required more precautions from health personnel, but has not affected the administration of healthcare given by them, or the monitoring of healthcare taken by patients. Had it not been for external concerns such as distance, transport, the poor reception of certain staff, or even complications during treatment, the pandemic did not have a considerable impact according to MNHS users. They told us this:

“Yes, I continued all my visits, I am satisfied. Everything went well, I was satisfied. The difference between before and the Covid period is that before they didn’t put too much pressure on people. [...] No since they were following me. It’s just the distance, the taxi wasn’t easy too. But I wasn’t shaking, why are you shaking?”

(Respondent 6)

“I had no prejudices about the hospital, rather good opinions. There have always been caring staff available 24 hours a day for patients. I didn’t say the service was slow, I said it was annoying. But it was effective. Obviously without the barrier measures the service would have gone a little faster.” (Respondent 11)

We might as well conclude that the services have remained the same, if not stricter than before the 2020 Covid-19 outbreak:

“Even with the barrier measures, things were going well.” (Respondent 6); “Everything was as before; as it’s the second time I’ve given birth there.” (Respondent 7)

**Users’ feelings about access to MNHS in the Cite-verte health district during the 2020 Covid-19 outbreak in Cameroon**

Pregnant women went to the hospital during the 2020 Covid-19 outbreak in Cameroon, despite the preconceptions of those around them, as the respondents testify in these terms:

“No, I’m going to the hospital; I had to follow my care, echography and all that. No, I’m not interested in what people say in the neighborhood.” (Respondent 3)

Some women managed to overcome the feeling of fear, stress and depression when the nursing staff respected barrier measures (wearing a mask, social distancing, etc.) in hospitals. The precautions adopted by the nursing staff encouraged pregnant women to be more confident in continuing and respecting care in hospitals. Thus, a respondent rightly chanted:

“[…] when I arrived, I was very afraid of being contaminated as the hospital was a major source of contamination. I saw the care there, and especially how the nurses and doctors protected themselves, I was reassured.” (Respondent 10)

Furthermore, the pandemic has had an indirect effect on the continuity of care in hospitals, as demonstrated by a respondent when she mentions the economic effects of the pandemic on daily activities. Thus, she emphasized in these terms:

“Yes, the economic constraint was serious because I no longer had any activity, there was no income, we were completely at a standstill, it was very difficult.” (Respondent 9)

This response raised the problem of financial accessibility to care in a context of lack, and inability to carry out a remunerative activity which is provider of income. The respondent commemorated a situation she experienced, from which she was negatively marked. This situation was implicitly reflected by the use of the qualifiers “difficult, very difficult”, and “serious” and the references “standstill”, and “there was no longer [...]”, reflecting difficult living conditions during the 2020 Covid-19 outbreak in Cameroon.

Beyond self-dependent factors, these patients were subjected to economic barriers, thus affecting the costs
and expenses related to their care. Furthermore, the distance from the hospital was considerable for some, but not enough to prevent them from continuing their care as supported by these words:

“The distance wasn’t too far. Compared to what was said in the neighborhood, when we arrive at the hospital we see that it is not true, we respect the barrier measures, they even oblige us. Doctors took all measures to avoid contamination.” (Respondent 6)

Discussion

Drop in number of MNHS health personnel

Our results showed that during the 2020 Covid-19 outbreak in Cameroon, more health workers left the MNHS and fewer health workers were assigned to them in the Cite-verte health district. In fact, our study reveals that during the 2020 Covid-19 outbreak in Cameroon, the number of health workers who left the MNHS in the Cite-verte health district increased by 3.5 times. Furthermore, the number of health personnel newly assigned to MNHS in the Cite-verte health district decreased by 69%. Therefore, the staff turnover or turnover rate at the MNHS had decreased by 79% in this health district.

We can therefore conclude after comparing the number of health personnel in MNHS between 2019 and 2020 that in Covid-19 settings, there was a drop in number of health personnel. This result agrees with the findings of Cena et al. (2021) [12]. In fact, in their study on the estimation of the impact of the Covid-19 pandemic on maternal and perinatal health care services in Italy, it emerged that 23.4% of health facilities found themselves under-effectiveduring the Covid-19 outbreak period for various reasons such as transfers of service and sick leave.

Disruption of MNHS due to stock shortage

In the Cite-verte Health District, the capacity to provide healthcare in MNHS was disrupted by stock shortage issues during the Covid-19 pandemic in 2020. In fact, the capacity to provide healthcare by MNHS was disrupted by stock shortage problems during the 2020 Covid-19 outbreak in 100% of health facilities surveyed for our study in the Cite-verte health district. This result is similar to that found by Adelekan et al. (2021) [13] in their study on the effect of the Covid-19 pandemic on the delivery of sexual and reproductive health services in primary health facilities of Nigeria where they reported difficulties during the lockdown included stock-outs of medicines in 25.7 % of health facilities concerned by the study.

Decline in the use of modern contraceptive methods

Our results showed that at the Cite-verte Health District, the number of new users of modern contraceptive methods has decreased from 3,938 in 2019 to 2,256 in 2020, thus making a drop of 1,682 and a relative fluctuation of 43%. The number of women and girls choosing a modern contraceptive method decreased by 4,772 from 8,122 in 2019 to 3,350 in 2020 for a fluctuation of 59%. According to the proportion tests the level of use of modern contraceptive methods presented a statistically significant drop. The observed drop in the family planning indicator (Number of users having chosen a modern contraceptive method) was statistically significant at 95% confidence and showed a significant difference of 9% in the level of use (Diff = 0.09; P-value = 0.000; 95%; CI= [0.075; 0.104]) at the Cite-verte health district from 2019 to 2020. This decline could be explained by factors such as government travel restrictions, problems in supply chains, and stock shortages. Our results are in the same direction as the estimates of Kakmandou/UNFPA (2021) [14] a year after the start of the pandemic which stipulated that 12 million women experienced an interruption of their contraception, causing 1.4 million unplanned pregnancies.

In the same order, Shapira et al. (2021) [15] conducted a study in eight sub-Saharan countries (Cameroon, Democratic Republic of Congo, Liberia, Malawi, Mali, Nigeria, Sierra Leone and Somalia) whose service volumes were extracted from the administrative systems of 63,954 establishments. The objective of the study was to quantify the disruption of maternal and child health services during the COVID-19 pandemic using comprehensive national-level administrative data. They found that significant monthly reductions in family planning consultations were estimated in four countries.

In contrast to our findings, in a study on the early indirect impact of the COVID-19 pandemic on reproductive, maternal, newborn, and adolescent health service utilization and outcomes conducted in Kenya by Shikuku et al. (2020) [16], they extracted data from the Kenya Health Information System for the first four months (March-June) of the pandemic and the equivalent period in 2019. It emerged that there were no differences in attendance average monthly between March-June 2019 and 2020 for family planning consultations (431,930.5 ± 19,059.9 vs 448,168.3 ± 31,559.8). However, they noted significant increases in the use of Family planning methods by youth (25.7% to 27.0%), and of injectable (short-term) contraceptive methods (58.2% to 62.3%).

Decrease of Antenatal Consultations attendance

Our results revealed that at the Cite-verte health district in general, the number of pregnant women of all age groups, registered for ANC 1 has decreased between 2019 and 2020 by 22%, going from 10,226 in 2019 to 7,935 in 2020. Furthermore, this reduction was narrowed to 15% for women aged 10 to 14 years old. The drop in attendance of women in ANC 1 equally rose to 56% for those aged 15 to 19 years old. For women
aged over 19 years old, however, we noted an increase in attendance for ANC 1 between 2019 and 2020. In the same direction, Shapira et al. (2021) [15] in their study carried out in eight sub-Saharan countries (Cameroon, Democratic Republic of Congo, Liberia, Malawi, Mali, Nigeria, Sierra Leone and Somalia) discovered that significant and persistent reductions were estimated in Nigeria for initiation of antenatal care (ANC), with a reduction estimated between 17% and 18% in April, May and July for the first ANC visit. In June, a significant and positive change was estimated for attendance at the first antenatal care visit. A similar pattern was observed in Mali for the total number of antenatal visits.

In contrast to our results, das Neves Martins Pires et al. (2021) [17] used a mixed method research on access to maternal and child health services (MCHS) in Nampula, Mozambique to compare indicators of MCHS use during the three months of the Covid-19 pandemic in Natikiri, Mozambique, in 2020, with data of 2019. Results showed an increase in number of pregnant women attending their first antenatal visit (19%) or making four antenatal visits (19%). However, in their study on the early indirect impact of the COVID-19 pandemic on the use and outcomes of reproductive, maternal, newborn, child and adolescent health services carried out in Kenya by Shikuku et al. (2020) [16], it emerged that there were no difference in monthly attendance average between March-June 2019 and 2020 for prenatal care (400,191.2±12,700.0 vs 384,697.3±20,838.6).

Drop in skilled birth attendance
According to our results, in the Cite-verte health district, there was an overall decrease of 28% in the number of deliveries carried out in health facilities which went from 9,441 in 2019 to 6,801 in 2020. Ashish KC et al. (2020) [18] support this idea through their study on assessing the number of institutional births, their outcomes (institutional stillbirth and neonatal mortality rates) and the quality of intrapartum care before and during the national COVID-19 lockdown, in which they found that institutional deliveries fell by more than half during the lockdown.

Aligned with our results on the drop in number of deliveries in health facilities, Goyal et al. (2021) [19] in their results found a small overall drop of 2.26%, Sharipra et al. (2021) [15] in their study also presented a small decrease of 5% in number of deliveries carried out in health facilities in Liberia during the COVID-19 pandemic. The same applies to das Neves Martins Pires et al. (2021) [17], who found a statistically significant 4% decrease in hospital deliveries during the COVID-19 pandemic (p=0.046). Atim et al. (2021) [20] in their study also supported this finding by showing a 3% decline in facility-based deliveries during the COVID-19 pandemic in Uganda.

Increase of maternal mortality
Our study reveals that in the Cite-verte health district, the number of maternal deaths had increased considerably between 2019 and 2020. This increase was estimated at nearly 65% in this health district where the number of maternal deaths had increased from 17 in 2019 to 28 deaths in 2020. This result is similar to that of Shikuku et al. (2020) [16]. They found that COVID-19 may have contributed to increase adolescent maternal mortality in Kenya (from 6.2% to 10.9%). Also, they showed that there was no significant change in the maternal mortality rate between the two periods (96.6 vs 105.8/100,000 live births, p = 0.1023) although the trend was towards the rise.

On the other hand, our results on the increase in maternal deaths in Covid-19 settings contrast with those of Burt et al. (2021) [21] in Uganda where in their observational study investigating the indirect effects of COVID-19 on maternal, newborn, child, sexual and reproductive health services conducted in Kawempe District of Kampala, found that between July 1 2019 and December 31, 2020, maternal mortality remained stable.

Decrease of neonatal mortality
According to our results, the number of neonatal deaths fell by almost 12% in the Cite-verte health district, going from 186 in 2019 to 164 in 2020. Likewise, the drop in neonatal deaths is statistically significant at 17% (Diff = 0.17; P-value = 0.000; 95%; CI= [0.076; 0.264]), which allows us to attest that there is a statistical difference between the number of neonatal deaths recorded in 2019 and in 2020 during the Covid-19 outbreak for the Cite-verte health district.

These results contrast with those of Ashish KC et al. (2020) [18] found that neonatal mortality in hospitals had increased from 13 per 1000 live births to 40 per 1000 live births (p = 0.0022) during the Covid-19 outbreak of 2020. Still in opposition to our results, Burt et al. (2021) in Uganda showed that between July 1, 2019 and December 31, 2020, neonatal mortality rate increased (from 39 to 49/1000 live births).

MNHS user needs met
According to the interviews we had with MNHS users, it emerged that they did not have any particular needs to submit to health personnel. Their needs were normal as usual: care for pregnant women, care for those who have given birth and care for newborns. With or without the presence of Covid-19, these women expressed the same needs. Despite the rigor of the barrier measures, they claim to have had their needs met, to have continuously followed prenatal visits, care related to childbirth and postnatal visits.

The satisfaction with the use of MNHS during the Covid-19 pandemic revealed by our study is aligned with the results proposed by Balogun et al. (2021) [22] which aimed to assess the difficulties faced by women who
Health Services at the Cite-verte health district in Yaounde-Cameroon during the 2020 Covid-19 outbreak on the continuity of Maternal and Neonatal Health Services (MNHS) at the Cite-verte health district from 2019 to 2020. We investigated the perceptions of MNHS users at the Cite-verte health district from 2019 to 2020. Finally, we represented the Covid-19 settings. Secondly, we compared the capacity of MNHS users in our study are similar to those revealed by Balogun et al. (2021) [23] when they confirmed that 18.13% of women were unable to access services because they did not have means of transport.

**MNHS users overcoming fear, stress and depression**

In their study on the challenges of accessing maternal and child health services during COVID-19 and the potential role of social media technologies, Musiimenta et al. (2022) [24] found that due to the COVID-19 crisis, 44 (88%) women felt stressed. Following these results, our study revealed that MNHS users managed to overcome the feeling of fear, stress and depression caused by the Covid-19 pandemic in hospital settings. In fact, in the health district of Cite-verte, compliance with barrier measures by nursing staff (wearing a mask, social distancing, etc.), and the precautions adopted by the nursing staff have succeeded in creating a feeling of security among pregnant women and those who have given birth for more assurance in continuing to observe care in hospitals despite the Covid-19 pandemic.

**Conclusion**

The aim of our study was to evaluate the impact of the 2020 Covid-19 outbreak on the continuity of maternal and neonatal health services (MNHS) at the Cite-verte health district in Yaounde-Cameroon. Given this objective, due to literature review and the context-based theory, we had to compare the capacity of maternal and neonatal health services in the Cite-verte health district between 2019 and 2020 which represented the Covid-19 settings. Secondly, we confronted the level of health service utilization in maternal and neonatal health services at the Cite-verte health district from 2019 to 2020. And finally, we analyzed the perceptions of MNHS users at the Cite-verte health district during the 2020 Covid-19 outbreak in Cameroon.

To reach this target, we formulated the research question of what was the impact of the 2020 Covid-19 outbreak on the continuity of Maternal and Neonatal Health Services at the Cite-verte health district in Yaounde-Cameroon. In order to analyze these MNHS continuity, each phenomenon was broken down into its different elements following the context-based theory. This model of health in his postulate, suggests that the behavior is a function of the organization and the context [25]. This behavior (continuity of MNHS) here was taken in the sense of the way in which something functions, works, evolves in certain circumstances [26]; the organization (Maternal and Neonatal Health Service) was taken in the sense of a set of services, offices assigned to a task; and an organized set [27] and the context was the presence of covid-19. We have therefore assessed the continuity of maternal and neonatal health services in the context of the Covid-19 pandemic, through its capacity, its level of utilization and its user’s perception.

Our study revealed that globally, as far as MNHS capacity was concerned, there was a drop in number of MNHS health personnel with an increase by 3.5 times of the number of health workers who left the MNHS in the Cite-verte health district and a decrease by 69% of the number of health personnel newly assigned to MNHS in the Cite-verte health district which therefore made a staff turnover rate decrease of 79%. Also, MNHS capacity to provide healthcare was disrupted by stock shortage issues during the Covid-19 pandemic of 2020 in 100% of health facilities surveyed for our study in the Cite-verte health district. While measuring the level of use of MNHS, we noticed a decline in the use of modern contraceptive methods. The observed drop in the family planning indicator (Number of users having chosen a modern contraceptive method) was statistically significant at 95% confidence and showed a significant difference of 9% in the level of use (Diff = 0.09; P-value = 0.000; 95%; CI= [0.075; 0.104]) at the Cite-verte health district from 2019 to 2020. We also found a decrease in Antenatal Consultations attendance with the number of pregnant women of all age groups, registered for ANC 1 decreasing between 2019 and 2020 by 22%, going from 10,226 in 2019 to 7,935 in 2020. In addition, there was a drop in skilled birth attendance with an overall decrease of 28% in the number of deliveries carried out in health facilities which went from 9,441 in 2019 to 6,801 in 2020. On the contrary, there was an increase of maternal mortality estimated at nearly 65% in this health district where the number of maternal deaths had increased from 17 in 2019 to 28 deaths in 2020. Fortunately, we noticed a decrease of neonatal mortality and the number of neonatal deaths fell by almost 12% in the Cite-verte health district, going from 186 in 2019 to 164 in 2020. Likewise, the drop in neonatal deaths is statistically significant at 17% (Diff = 0.17; P-value = 0.000; 95%; CI= [0.076; 0.264]), which allows us to attest that there is a statistical difference between the number of neonatal deaths recorded in
2019 and in 2020 during the Covid-19 outbreak for the Cite-verte health district. According to the interviews we had with MNHS users concerning their perception, it emerged that they finally found an overall high satisfaction of care given by them, or the monitoring of care taken by patients. The main reason was that MNHS users had managed to overcome the feeling of fear, stress and depression caused by the Covid-19 pandemic in hospital settings.

To mitigate the impact of Covid-19 on MNHS continuity, Health managers must be ready to recruit more personnel, provide more supplies, and emphasize on community involvement during the outbreak.

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Conflict of Interests
Authors declare no conflict of interest.

References
[16] Shikuku DN, Nyaoke IK, Nyaga LN, Ameh CA. Early indirect impact of COVID-19 pandemic on utilisation and outcomes of reproductive, maternal, newborn, child and adolescent health services in Kenya:


[26] Larousse. Définitions : comportement - Dictionnaire de français Larousse [Internet]. 2021 [cité 21 juin 2022]. Available at: https://www.larousse.fr/dictionnaires/francais/comportement/17728

[27] Larousse É. Définitions : organisme - Dictionnaire de français Larousse [Internet]. 2021 [cité 21 juin 2022]. Available at: https://www.larousse.fr/dictionnaires/francais/organisme/56427